

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



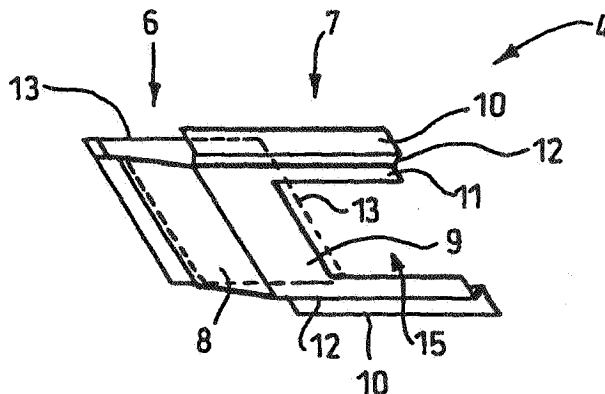
(43) International Publication Date
19 April 2001 (19.04.2001)

PCT

(10) International Publication Number
WO 01/27863 A1

- (51) International Patent Classification⁷: G06K 7/00 (74) Agents: PRATT, David, Martin et al.; Withers & Rogers, Goldings House, 2 Hays Lane, London SE1 2HW (GB).
- (21) International Application Number: PCT/GB00/03846
- (22) International Filing Date: 6 October 2000 (06.10.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
9923919.6 8 October 1999 (08.10.1999) GB
- (71) Applicant (for all designated States except US): UBINET-ICS LIMITED [GB/GB]; Cambridge Technology Centre, Melbourn, Hertfordshire SG8 6DP (GB).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): GASKELL, Thomas, Albert [GB/GB]; 18 Kingfisher Walk, Linton, Cambridgeshire CG1 6UA (GB). ALLEN, Dominic [GB/GB]; 6 Burgess Park Mansions, Fortune Green Road, London NW6 1DP (GB). SCHREMMER, Andreas [DE/DE]; Hermann-Hesse-Strasse 12/1, 73614 Schorndorf (DE).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:
— With international search report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A SIM CARD HOLDING DEVICE



(57) Abstract: A S.I.M. card holding device (4) is provided in an apertured region (13) of a communication device casing (1). The S.I.M. card holding device comprises a card insert region (6) and a card holding region (7), both regions being formed from sheet metal material. The card insert region is formed from a ramp (8) for guiding an inserted S.I.M. card into the card holding region. The card holding region comprises an apertured surface (9, 11) having holding members for securing the inserted S.I.M. card in position over a connector (21) situated below the apertured surface, such that electrical contacts of the S.I.M. card are in connection with the connector.

WO 01/27863 A1

A SIM Card Holding Device

This invention relates to a S.I.M. card holding device, and in particular to a S.I.M. card holding device for connecting a S.I.M. card to a P.C. card for, for example, a personal
5 computer.

Most cellular mobile communication devices, such as mobile telephones, require the use of a so-called Subscriber Identity Module (S.I.M.) card, generally comprising a microchip having user information stored thereon. Such user information is provided
10 for, amongst other things, identifying the user account to the particular cellular network being used. Other information is also stored on the device, such as telephone number entries.

In recent years, the use of portable personal computers (laptop and hand-held
15 computers) as mobile communication devices has grown. The laptop or hand-held computer can be provided with a special module, usually in the form of a plug-in peripheral circuit board in a slim casing (known as a PC card, and previously as a PCMCIA card) which is configured to enable the laptop computer to use a cellular communications network. The PC card is usually enclosed within a metal case, with
20 connectors being provided at an edge region for connection with the computer. Upon plugging-in the PC card to the computer, the user is able to use his laptop or hand-held computer as a telephone, a fax machine, an E-Mail terminal, or even as an Internet terminal, all using a wireless connection. A S.I.M. card is required to be connected to the PC card to provide the PC card and the associated cellular network with the user
25 information, as discussed above.

S.I.M. cards are usually in the form of, either a credit-card size card (measuring approximately 85mm x 54mm x 0.8mm), or a smaller card (measuring approximately 25mm x 15mm x 0.8mm). Whatever form they take, the cards have a small active area
30 provided on one face of the card for connection with contacting elements of the PC card circuit board or a separate S.I.M. connector. A S.I.M. card holding device is provided

on the PC card for securely holding the S.I.M. card in position over the contacting elements. However, a conventional S.I.M. card holding device has disadvantages in that it occupies a relatively large area within the PC card case, and requires a large printed circuit board footprint area. This may require manufacturers to use both larger
5 PC card cases and larger printed circuit boards, requiring the PC card size to extend beyond the preferred standard dimensions (type 2 PCMCIA dimensions). In addition, a conventional holding device may limit flexibility, in that the location of the S.I.M. card with respect to a PC card p.c.b. is limited to certain positions. Further, some designs of conventional holding device require some sort of special tool for removal of the S.I.M.
10 card. Other problems exist in that conventional holding devices can be awkward to use, and can break if used incorrectly.

According to a first aspect of the invention, there is provided a S.I.M. card holding device comprising: a card insert region; and a card holding region, the card insert region
15 having a sloping or recessed surface, and the card holding region having an apertured surface and a holding member disposed adjacent to the apertured surface, wherein the holding member of the card holding region is arranged to accept, and retain in position over the apertured surface, a S.I.M. card inserted from the card insert region.

20 The card insert region of the S.I.M. card holding device may include an alignment edge protruding from an edge region of the sloping or recessed surface. The card insert region of the holding device may be attached to an appropriately-positioned aperture in the casing surface of a communication device, such as the casing of a PC card for a computer, such that the holding region is inside the casing, with the aperture of the
25 apertured surface being positioned over a S.I.M. card connector. A S.I.M. card may be inserted by placing it onto the sloping surface (or into the recessed surface) of the card insertion region, and then by sliding along an alignment edge to a position within the holding region. The alignment edge may be formed as a protrusion from the edge region of the sloping or recessed surface. However, it will be appreciated that the
30 casing of the PC card may be appropriately cut so that an alignment edge is formed from a folded edge of the casing. Of course, two opposing alignment edges may be provided. By making the distance between the alignment edges approximately equal to

either the width or length of the S.I.M. card, correct orientation of the S.I.M. card is ensured.

5 The card insert region of the S.I.M. card holding device may be integrally formed within the housing or enclosure of an electrical device. Such an electrical device may be a PC card, the enclosure of the PC card being formed so as to incorporate the S.I.M. card holding device.

10 In the card holding region, the S.I.M. card is secured within the holding member so that the active area of the S.I.M. card is positioned over the apertured region to contact with a S.I.M. card connector that may be positioned on a printed circuit board below. Part of the S.I.M. card preferably remains within the card insert region to allow the card to be removed.

15 The card holding device provides for design flexibility in that it can be positioned on almost any part of the PC card casing, provided an appropriately sized aperture is cut. Accordingly, if the circuitry of the PC card is redesigned, with the S.I.M. card connector being positioned in or over a different area of the board, a differently positioned aperture may simply be cut into new casings to enable the S.I.M. card to be
20 connected to the newly positioned connector. By positioning the device above the circuit board, any increase in the circuit board size is minimised. A minimum footprint area of circuit board is used. The holding device may be fully integrated with the casing, and may be made robust.

25 Preferably, the sloping or recessed surface of the card insertion region is generally planar.

The card holding members may comprise opposing edge regions, having alignment edges projecting upwards to ensure alignment of an inserted S.I.M. card with respect to
30 the aperture of the apertured surface. The alignment edges of the holding region are, preferably, aligned with respective alignment edges of the insertion region. A stop

member may be provided at a rear edge of the holding region to prevent the S.I.M. card from being inserted too far into the holding device.

According to a second aspect of the present invention, there is provided a method of
5 providing a communications device, the communications device having a casing, the method comprising: creating an aperture within a surface of the casing; and attaching a S.I.M. card holding device to an edge of the aperture, the S.I.M. card holding device comprising: a card insert region; and a card holding region, the card insert region having a sloping or recessed surface, and the card holding region having an apertured
10 surface and a holding member disposed adjacent to the apertured surface, wherein the card holding region is arranged to accept and hold in position over the apertured surface, a S.I.M. card inserted from the card insert region.

According to a third aspect of the present invention, there is provided a method of
15 providing a communications device having a casing, the method comprising: creating an aperture within a surface of the casing; and forming a S.I.M. card holding device, part of the S.I.M. card holding device being formed integrally with the casing, the S.I.M. card holding device comprising: a card insert region; and a card holding region, the card insert region having a sloping or recessed surface, and the card holding region
20 having an apertured surface and a holding member disposed adjacent to the apertured surface, wherein the card holding region is arranged to accept and hold in position over the apertured surface, a S.I.M. card inserted from the card insert region.

According to a fourth aspect of the present invention, there is provided a
25 communications device comprising a printed circuit board disposed within a casing thereof, and a S.I.M. card holding device arranged on a surface of the casing, the printed circuit board having a S.I.M. card connector and a S.I.M. card guide member attached thereto, the S.I.M. card guide member being positioned adjacent the S.I.M. card holding device so as to position a S.I.M. card, inserted therein, over the S.I.M. card
30 connector.

The invention will be described, by way of example, with reference to the accompanying drawings, in which :

Figure 1 is a perspective view of the underside of a PC card enclosure lid, incorporating the S.I.M. card holding device, constructed in accordance with a first embodiment of the present invention;

Figure 2 is a close-up view of the S.I.M. card holding device of Figure 1;

Figure 3 is a cross-section taken on the line A-A of Figure 1;

Figure 4 is a cross-section, similar to that of Figure 3, of a second embodiment of the present invention;

Figure 5 is a side-sectional view of a S.I.M. card holding device used in combination with a card guide member, in accordance with a third embodiment;

Figure 6 is an isometric view of the card deflecting member of Figure 5, positioned on a printed circuit board; and

Figure 7 is an isometric view of part of the S.I.M. card holding device shown in Figure 5.

Referring to the drawings, Figure 1 shows a lid portion 1 of a PC card, the lid portion 1 being viewed from the underside. The lid portion 1 has two major surfaces, namely, an inner lid surface 2, and an outer lid surface 3. A S.I.M. card holding device 4 is provided in a central region of the lid portion 1. The S.I.M. card holding device 4 is designed to hold the smaller size of S.I.M. card, i.e. that measuring 25mm x 15mm x 0.8mm. The S.I.M. card holding device 4 is provided so as to accept and retain a S.I.M. card for connection to a S.I.M. card connector (not shown). It will be understood that the S.I.M. card connector will form part of the circuitry located within a base region enclosure (not shown) of the PC card. When the lid portion 1 is assembled to the base

region enclosure, the S.I.M. card connector will project upwards in the direction of an arrow 5.

Referring now to Figure 2, the S.I.M. card holding device 4 (referred to hereinafter as the card holding device) of Figure 1 is shown in more detail. It will be noted that a rectangular hole 13 (shown in dotted lines on Figure 2) is provided in the lid portion 1 of the PC card enclosure. This hole 13 provides for the insertion, and removal, of S.I.M. cards into, and out of, the card holding device 4. The card holding device 4 comprises a card insert region 6 and a card holding region 7, both regions being integrally formed together from sheet metal material. The card insert region 6 comprises a so-called "ramp" 8 which is essentially a sloping metal surface. The card holding region 7 comprises an apertured surface 9, 11, defining an aperture 15. Upwardly-projecting alignment members 12 are provided along the edges of the surface 9, 11 the alignment members being bent at their upper regions to form attachment surfaces 10. Although two alignment members 12 are shown in Figure 2, it will be appreciated that a single alignment member is sufficient to hold a S.I.M. card in position.

As shown in Figure 2, the card holding device 4 is attached to the inner lid surface 2 so that ramp region 8 of the card holding device is located directly beneath the hole 13. To insert the S.I.M. card into the card holding device 4, the card is placed in the hole 13 (the hole being appropriately dimensioned so as to ensure correct orientation of the S.I.M. card) and positioned on the ramp 8. Having placed the S.I.M. card in the hole 13, it may then be pushed into the holding region 7, where it is secured between the surface 9, 11 and the inner lid surface 2. The apertured region 15 is dimensioned so as to expose the active area of any inserted S.I.M. card to a S.I.M. card connector located directly beneath. Accordingly, it will be appreciated that alignment of the S.I.M. card within the holding region 7 must be accurate to ensure that a correct connection is achieved. This is achieved by the provision of the upwardly-projecting alignment members 12, which prevent lateral movement of the S.I.M. card when in position. Preferably, there may be provided a stop (not shown) adjacent to the end of the surface 9, 11 so as to prevent the S.I.M. card travelling too far into the card holding device 4.

Preferably, alignment edges are provided along both sides of the ramp 8, their edges enabling the S.I.M. card to be slidably moved up and down the ramp, without moving from side to side. This may be facilitated by providing upwardly-extending members
5 (not shown) on the edges of the ramp region 8. Alternatively, this may be achieved by cutting the hole 13 in the lid portion 1 so that the edges may be folded-down to provide any necessary alignment along the edges of the ramp 8.

The dimensions of the holding region 7 ensure that, when the S.I.M. card is secured in
10 position within the card holding device 4, a portion of the S.I.M. card will remain within the card insert region 6, i.e. on the lower part of the ramp 8. This allows for easy removal of the S.I.M. card by use of a finger to press on the upper surface of the S.I.M. card and withdrawing it into the card insert region 6, and will not require the use of special tools etc. Of course, should the S.I.M. card become stuck for some reason, it
15 may be removed using a simple tool such as a paper clip, access being gained via a small hole (not shown) in the lid portion 1.

The above-described two-piece holding device may be attached to the inner lid surface
2 by soldering, welding, or any suitable adhesive.

20

In a modified form of the first embodiment (not shown), the card holding device 4 may be formed as part of the actual lid portion 1. In this embodiment, the rectangular hole 13 is formed by cutting the lid portion along three sides, and bending down the resulting "tongue". This tongue is thereafter shaped to form the card holding device 4 .
25 Preferably, no holes or gaps should be visible through the lid portion 1.

In another modified form of the first embodiment (not shown), the card holding device may be formed by cutting and pressing (or otherwise forming) part of the lid portion 1 down to form the features of this device. In this case, no additional formed part is
30 required, and only one edge needs to be cut.

The dimensions of the card holding device 4, whichever embodiment is used, should be such so as to ensure that there is sufficient room beneath to avoid touching components on the PC card printed circuit board.

5 In use, the underside of the lid portion 1 in the region of the S.I.M. card connector (and any other required area) may be covered with an insulating material, such as a label, to ensure that the contacts of the S.I.M. connector or the S.I.M. card do not short, if they happen to touch the casing.

10 The ramp 8 may be modified to enhance the retention of the S.I.M. card when inserted in the card holding device 4. This may comprise a small flexible member, located in the middle of the ramp 8, which member is pushed down by the S.I.M. card during insertion, and then springs up behind the S.I.M. card when it is fully inserted. Removal is achieved by pushing the flexible member down.

15

It will be appreciated that the card holding device described above provides for design flexibility, in that it can be positioned on almost any part of the PC card lid portion 1. Accordingly, if the circuitry of the PC card is redesigned, with the S.I.M. card connector being positioned in a different area of the board, the card holding device may
20 be moved accordingly. In the case of the first described embodiment, this is achieved by simply repositioning the hole in the design of new lid portions, and attaching the card holding device 4 beneath it, or, in the case of the second or third embodiments, cutting the tongue or cutting and pressing in the new location.

25 Referring to Figure 3, a side-sectional view of the card holding device 4 shows the sloping arrangement of the ramp 8 and the means by which an inserted S.I.M. Card (not shown) can be secured between the upper surface of the card insert region 6 and the card holding region 7.

30 It will be apparent that modifications could be made to the device described above. For example, instead of a sloping ramp 8, the device could have a recessed surface (see Figure 4 which shows a second embodiment of card holding device having a recessed

region 8a through which the S.I.M. card can be inserted, prior to being slid into position). The device could also be modified to accommodate the newly-proposed S.I.M. card which has even smaller dimensions than those of the smaller size mentioned above. Moreover, the device itself could be made of any suitable material such as a plastics material. It would also be possible to replace the alignment edges 12 by parts of the casing of the PC card, parts of the casing of the S.I.M. card holding device, or even components of the PC card.

A third embodiment of the present invention is shown in Figures 5 to 7. This embodiment is similar to that of Figures 1 to 3, so like reference numerals will be used for like parts, and only the modifications will be described in detail. In this embodiment, the card holding region includes a separate card guide member 17. As Figure 6 more clearly shows, the guide member 17 comprises a generally U-shaped member.

Referring back to Figure 5, the card guide member 17 is fixedly located (e.g. by solder or screws) onto a printed circuit board 19 which forms part of a communications device and is positioned over a S.I.M. card connector 21 with an open end 17a of the guide member being aligned to the card insert region 6. The card guide member 17 is dimensioned so as to receive an inserted S.I.M. card 23 within the U-shaped body, and is arranged such that the card is positioned just below the top inner surface of the U-shaped body. In this way, the electrical contacts (not shown) of the S.I.M. card 23 remain secured against contacts 22 of the S.I.M. card connector 21, without requiring the inner lid surface 2 of the lid portion to maintain the contact engagement. In this regard, it will be appreciated that the tolerances involved in producing the lid portion in such a way that the S.I.M. card 23 is maintained in correct engagement with the S.I.M. card connector 21, can make the lid difficult and/or expensive to produce. Further, the lid portion may become damaged or deformed in normal use, and so, without the card guide member 17, there is a possibility that the electrical connection between the S.I.M. card 23 and the S.I.M. card connector 21 may be disrupted.

Referring to Figure 7, the card insert region 6 of the S.I.M. card holding device 4' is shown from beneath the inner lid surface 2. It will be seen that the card insert region 6 is the same as that shown in Figure 2. However, in this case, the card holding region is formed by the combination of the planar surface 27 at the end of the ramp 8, and the
5 card guide member 17 (not shown in Figure 7) which forms a card holding member.

The S.I.M. card guide member 17 may be formed from any rigid material, e.g. a metal or plastics material. The internal dimensions of the U-shaped body should be such that its width corresponds closely with the width of the S.I.M. card 23, so as to prevent or
10 minimise lateral movement.

In order to improve alignment between the open end of the card deflecting member 17 and the card insert region 6, alignment tabs 25 may be included at the side-portions of the generally U-shaped body. Thus, any misalignment between the S.I.M. card 23 and
15 the guide member 17 will be accommodated by the alignment tabs 25. A further tab (not shown) could also be included at the upper portion of the generally U-shaped body to ensure that the S.I.M. card 23 enters the body just beneath the upper inner surface.

In summary, the card holding device described above has further advantages over prior
20 art devices, in that the area occupied by the holding device within a PC card enclosure is reduced. Alternative devices may not maintain good continuity of electromagnetic screening, which can cause problems in meeting electromagnetic compatibility (EMC) performance requirements. The card holding device described above provides good EMC screening, is robust and is less fragile than prior art devices.

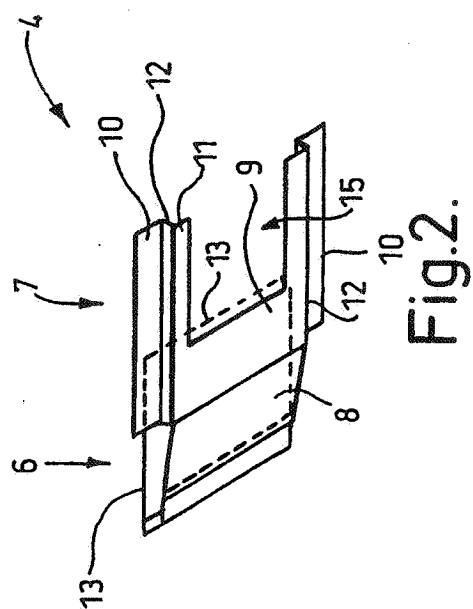
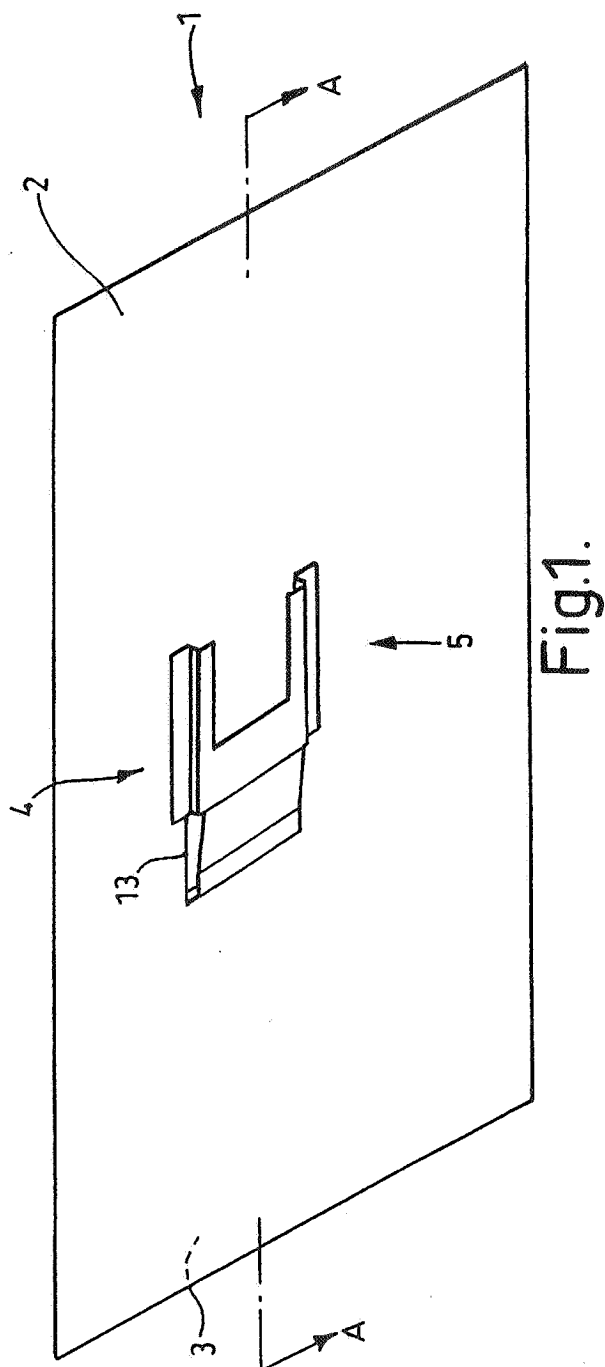
Claims

1. A S.I.M. card holding device comprising: a card insert region; and a card holding region, the card insert region having a sloping or recessed surface, and the card holding region having an apertured surface and a holding member disposed adjacent to the apertured surface, wherein the holding member of the card holding region is arranged to accept, and retain in position over the apertured surface, a S.I.M. card inserted from the card insert region.
2. A S.I.M. card holding device according to claim 1, wherein the card insert region includes an alignment edge protruding from an edge region of the sloping or recessed surface.
3. A S.I.M. card holding device according to claim 2, wherein the alignment edge is formed from a folded edge of a casing for a communication device.
4. A S.I.M. card holding device according to claim 2 or claim 3, wherein two alignment edges are provided.
5. A S.I.M. card holding device according to claim 4, wherein the distance between the alignment edges is approximately equal to either the width or length of the S.I.M. card to be received.
6. A S.I.M. card holding device according to any preceding claim, wherein the card insert region is attached to an aperture within a casing surface of a communication device, the card holding region being within the body of the casing.
7. A S.I.M. card holding device according to claim 6. wherein the apertured surface is arranged to be positioned over a S.I.M. card connector located on a printed circuit board within the casing.

8. A S.I.M. card holding device according to any preceding claim, wherein the sloping or recessed surface of the card insert region is generally planar.
9. A S.I.M. card holding device according to any preceding claim, wherein the
5 holding member comprises one or more edge regions having an alignment edge projecting upwards therefrom, the alignment edge(s) being arranged to hold an inserted S.I.M. card in position with respect to the apertured surface.
10. A S.I.M. card holding device according to claim 9, wherein two opposing edge
10 regions are provided, each edge region having an alignment edge projecting upwardly therefrom.
11. A S.I.M. card holding device according to claim 9 or claim 10, wherein the
15 alignment edge(s) are aligned with a respective alignment edge provided in the card insert region.
12. A S.I.M. card holding device according to any preceding claim, wherein the card holding region includes a stop member at a rear edge thereof.
- 20 13. A S.I.M. card holding device according to any preceding claim, wherein the S.I.M. card holding device is formed integrally within the housing or enclosure of a communications device.
14. A method of providing a communications device having a casing, the method
25 comprising: creating an aperture within a surface of the casing; and attaching a S.I.M. card holding device to an edge of the aperture, the S.I.M. card holding device comprising: a card insert region; and a card holding region, the card insert region having a sloping or recessed surface, and the card holding region having an apertured surface and a holding member disposed adjacent to the apertured surface, wherein the
30 card holding region is arranged to accept and hold in position over the apertured surface, a S.I.M. card inserted from the card insert region.

15. A method of providing a communications device having a casing, the method comprising: creating an aperture within a surface of the casing; and forming a S.I.M. card holding device, part of the S.I.M. card holding device being formed integrally with the casing, the S.I.M. card holding device comprising: a card insert region; and a card
5 holding region, the card insert region having a sloping or recessed surface, and the card holding region having an apertured surface and a holding member disposed adjacent to the apertured surface, wherein the card holding region is arranged to accept and hold in position over the apertured surface, a S.I.M. card inserted from the card insert region.
- 10 16. A communications device comprising a printed circuit board disposed within a casing thereof, and a S.I.M. card holding device arranged on a surface of the casing, the printed circuit board having a S.I.M. card connector and a S.I.M. card guide member attached thereto, the S.I.M. card guide member being positioned adjacent the S.I.M. card holding device so as to position an inserted S.I.M. card over the S.I.M. card
15 connector.
17. A communications device according to claim 16, wherein the S.I.M. card holding device is in accordance with any of claims 1 to 13.
- 20 18. A communications device according to claim 16 or claim 17, wherein the S.I.M. card guide member comprises a generally U-shaped member having at least one open end.
- 25 19. A communications device according to any of claims 16 to 18, wherein the S.I.M. card guide member includes a cavity, the width of which corresponds substantially to the width of a S.I.M. card.
- 30 20. A communications device according to any of claims 16 to 19, wherein the S.I.M. card guide member includes alignment tabs at an open part thereof, for guiding an inserted S.I.M. card within the open part.

1/3



2 / 3

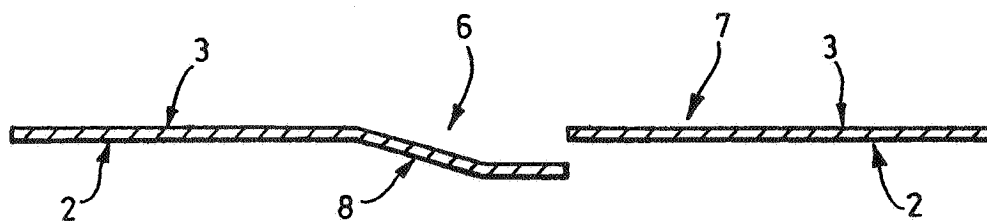


Fig.3.

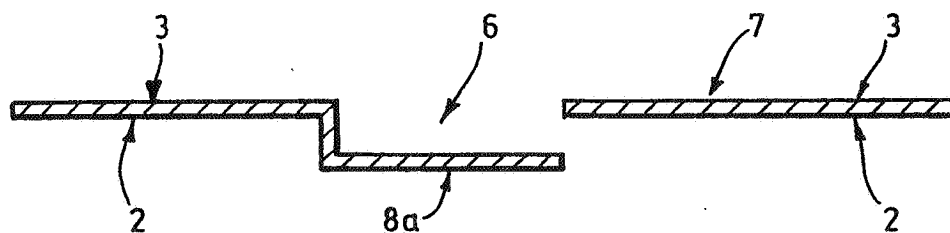


Fig.4.

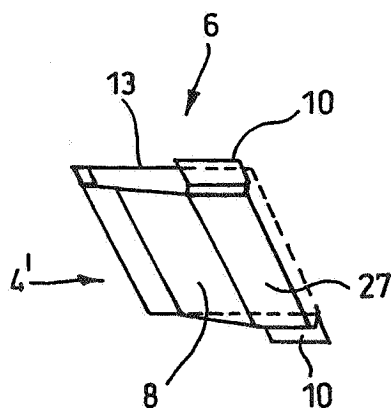


Fig.7.

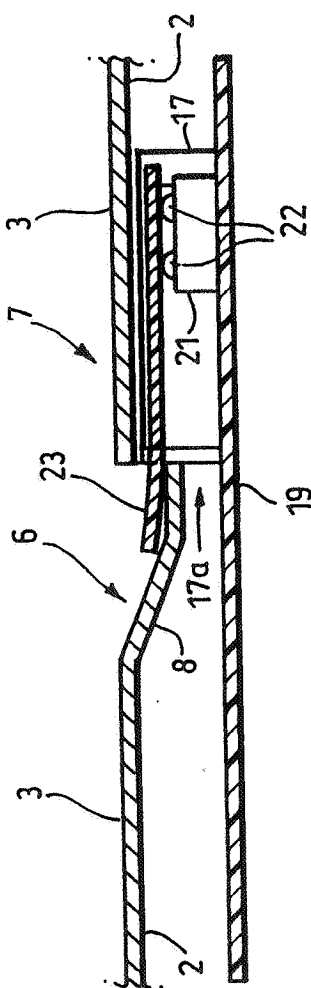


Fig.5.

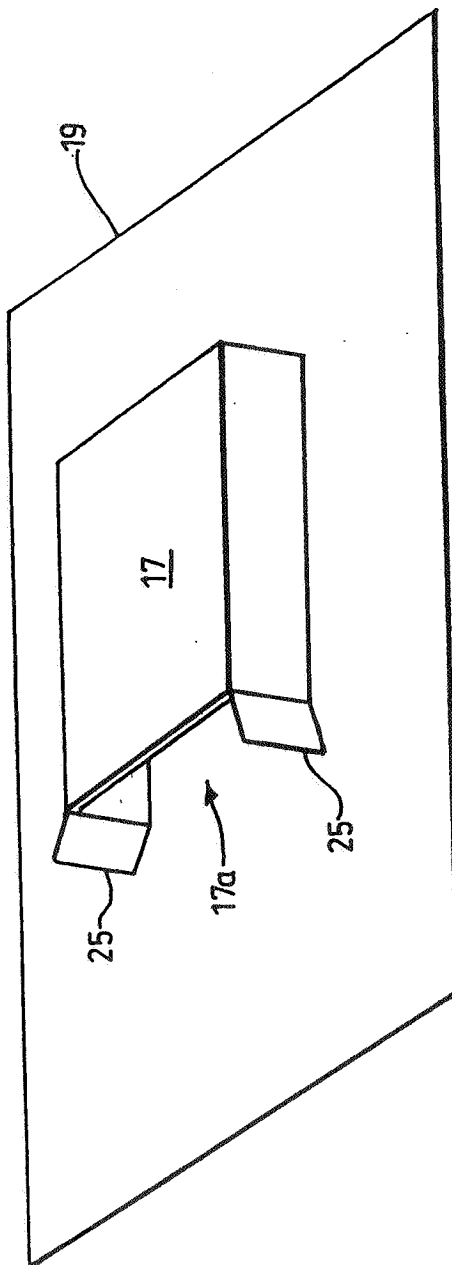


Fig.6.

INTERNATIONAL SEARCH REPORT

Intern. Application No
PCT/GB 00/03846

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06K7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06K H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 195 15 713 A (AMPHENOL TUCHEL ELECT) 31 October 1996 (1996-10-31) column 7, line 28 -column 8, line 5 column 8, line 49 - line 65 figures 6,12 ---	1-20
X	US 5 823 828 A (BRICAUD HERVE GUY ET AL) 20 October 1998 (1998-10-20) column 2, line 35 -column 5, line 13 figures 1-10 ---	1-19
X	EP 0 896 289 A (WHITAKER CORP) 10 February 1999 (1999-02-10) column 2, line 32 -column 4, line 28; figures 1-6 --- -/-	1,6-10, 12-20

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

18 December 2000

Date of mailing of the international search report

27/12/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

de Ronde, J.

INTERNATIONAL SEARCH REPORT

Intern. nat Application No
PCT/GB 00/03846

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>EP 0 915 430 A (YAO LI HO) 12 May 1999 (1999-05-12) figure 2 figures 1-6</p> <p>-----</p>	20

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/03846

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19515713 A	31-10-1996	NONE	
US 5823828 A	20-10-1998	FR 2742561 A EP 0738983 A JP 9274976 A	20-06-1997 23-10-1996 21-10-1997
EP 0896289 A	10-02-1999	JP 11067389 A	09-03-1999
EP 0915430 A	12-05-1999	NONE	